

### 10-3 Properties of Logs

$$b > 0 \quad b \neq 1$$

$$m > 0 \quad n > 0$$

$$1. \log_b m n = \log_b m + \log_b n$$

$$2. \log_b m/n = \log_b m - \log_b n$$

$$3. \log_b m^p = p \cdot \log_b m$$

Yes!

Simplify.

ex

$$\begin{aligned}
 & 2\log_{10} 5 + \log_{10} 4 \\
 & \log_{10} 5^2 \\
 & \log_{10} 25 + \log_{10} 4 \\
 & \log_{10} 100 = \textcircled{2}
 \end{aligned}$$

ex

$$\begin{aligned}
 & 2\log_3 6 - \log_3 4 \\
 & \log_3 36 - \log_3 4 \\
 & \log_3 \frac{36}{4} \\
 & \log_3 9 = \textcircled{2}
 \end{aligned}$$

ex

$$\log_4 40 - \log_4 5$$

$$\log_4 8$$

$$\left(\frac{3}{2}\right)$$

ex

$$\log_4 3 - \log_4 48$$

$$\log_4 \frac{1}{16}$$

$$(-2)$$

ex Expand

$$\log_6 m^2 n^3$$

$$\log_6 m^2 + \log_6 n^3$$

$$2 \log_6 m + 3 \log_6 n$$

ex Expand

$$\log_4 \sqrt{\frac{m}{n^5}}$$

$$\log_4 \left(\frac{m}{n^5}\right)^{\frac{1}{2}}$$

$$\frac{1}{2} \left[ \log_4 \frac{m}{n^5} \right]$$

$$\frac{1}{2} \left[ \log_4 m - 5 \log_4 n \right]$$

Solve.

ex

$$\log_5 x = 3\log_5 2 + \log_5 7$$

$$\log_5 2^3 + \log_5 7$$

$$\log_5 x = \log_5 56$$

$$x = 56$$

Solve.

ex

$$\log_3 x = 2\log_3 3 + \log_3 5$$

$$\log_3 9 + \log_3 5$$

$$x = 45$$

Solve.

ex

$$\log_b(x+3) = \log_b 8 - \log_b 2$$

$$\log_b x + 3 = \log_b 4$$

$$x + 3 = 4$$

$$x = 1$$

Solve.

ex

$$\log_7(x+1) + \log_7(x-5) = 1$$

$$\log_7(x+1)(x-5) = 1$$

$$\log_7(x^2 - 4x - 5) = 1$$

$$7^1 = x^2 - 4x - 5$$

$$0 = x^2 - 4x - 12$$

$$(x - 6)(x + 2)$$

$$x = 6 \quad x = -2$$

Given:

$$\log_3 7 \approx 1.7712$$

$$\log_3 2 \approx 0.6310$$

$$\log_3 3^p = p$$

ex

$$\log_3 54$$

$$\log_3 3^3 = y$$

$$3^y = 3^3$$

$$y = 3$$

$$\log_3 3^3 \cdot 2$$

$$\log_3 3^3 + \log_3 2$$

$$3 + .6310$$

$$\underline{3.6310}$$

$$\begin{array}{c} 54 \\ \wedge \\ 9 \cdot 6 \\ 3^3 \cdot 2 \end{array}$$

ex

$$\log_3 .25$$

$$\log_3 \frac{1}{4}$$

$$\log_3 2^{-2} \rightarrow -2(\log_3 2)$$

$$-2 \cdot .6310$$

$$\underline{-1.2620}$$

Given:

$$\log_3 7 \approx 1.7712$$

$$\log_3 2 \approx 0.6310$$

$$\log_3 3^p = p$$

ex

$$\log_3 9/49$$

$$\log_3 9 - \log_3 49$$

$$\log_3 3^2 - \log_3 7^2$$

$$2 - 2(1.7712)$$

$$2 - 3.5424$$

$$\underline{-1.5424}$$

Given:

$$\log_3 7 \approx 1.7712$$

$$\log_3 2 \approx 0.6310$$

$$\log_3 3^p = p$$

ex

$$\log_3 7/2$$

$$\log_3 7 - \log_3 2$$

$$1.7712 - .6310$$

$$\underline{1.1402}$$

Given:

$$\log_3 7 \approx 1.7712$$

$$\log_3 2 \approx 0.6310$$

$$\log_3 3^p = p$$

ex

$\log_3 18$

$18 = 3^2 \cdot 2$

Given:

$\log_3 7 \approx 1.7712$

$\log_3 2 \approx 0.6310$

$\log_3 3^p = p$

$\log_3 3^2 + \log_3 2$

$2 + .6310$

$2.6310$

ex

$\log_3 2/3$

Given:

$\log_3 7 \approx 1.7712$

$\log_3 2 \approx 0.6310$

$\log_3 3^p = p$

$\log_3 2 - \log_3 3$

$.6310 - 1$

$-.3690$

**HW**

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